

## REMARKS

Applicants' invention relates to monodisperse anion exchangers and their preparation by (a) reacting monomer droplets made from monovinylaromatic compounds and polyvinylaromatic compounds, as well as optional porogens and/or initiators, (b) amidomethylating the resultant monodisperse, crosslinked bead polymers with (methyl)phthalimide, (c) converting the amidomethylated bead polymers to aminomethylated bead polymers, and (d) alkylating the aminomethylated bead polymers.

### Restriction Requirement

Restriction has been required under 35 U.S.C. 121 to one of the following groups:

- Group I: Claims 1-15, drawn to a process for making anion exchangers
- Group II: Claims 16-18, drawn to anion exchangers
- Group III: Claims 19-21, drawn to a process for treating water
- Group IV: Claim 23, drawn to amidomethylated bead polymers
- Group V: Claim 24, drawn to aminomethylated bead polymers

Applicants hereby acknowledge election of Group I (Claims 1-9) with traverse with respect to Group II but without traverse with respect to Groups III, IV, and V. The non-elected claims of Groups III, IV, and V have been canceled.

The restriction requirement that is being traversed is premised on an asserted patentable distinction between Groups I and II. However, Claim 16 is a product-by-process claim directed to anion exchangers prepared by the process of Claim 1. Consequently, the claims of Group II are so intimately intertwined with the claims of Group I that all of the claims should be examined together.

Therefore, Applicants respectfully request withdrawal of the restriction requirement with respect to Groups I and II.

### Objection to the Abstract

The Abstract stands objected to as failing to provide a summary sufficient to enable the reader to ascertain the gist of the invention. Applicants have amended the Abstract to provide a more complete summary of the subject matter of their invention.

Applicants therefore submit that the objection has been traversed.

Rejection under 35 U.S.C. 112

Claims 1-15 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite with respect to the term "derivatives" used in Claims 1 and 14. Applicants respectfully traverse.

Applicants respectfully submit that those skilled in the art would readily understand that, in addition to phthalimide itself, a variety of phthalimide derivatives would serve essentially the same function in step (b) of the claimed process, as explained at page 8, lines 8-13. However, Applicants have amended their claims to specify the use of phthalimide or methylphthalimide, which are specifically disclosed in their specification at page 8, lines 11-13.

Rejection under 35 U.S.C. 103

Claims 1-15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patents 4,382,124 ("Meitzner et al"), 4,952,608 ("Klipper et al"), and 3,006,866 ("Corte et al '866"). Applicants respectfully traverse.

Applicants note by way of preliminary comment with respect to Meitzner et al that, contrary to what is stated at page 5 of the Office Action, Applicants did not acknowledge at page 2 of their disclosure that Meitzner et al teaches step (a) of their claimed process. Although disclosure at page 2 states that "[t]he monodisperse, crosslinked vinylaromatic base polymer according to process step (a) may be prepared by the processes known from the literature" and identifies several U.S. and foreign documents that describe such processes, Meitzner et al is not among the patents mentioned in that context. Applicants' only reference to Meitzner et al is found in a discussion at page 5, lines 16-26, about the optional porogen component. Although this discussion also mentions that Meitzner et al gives "[a]n overview of preparation methods for macroporous bead polymers," this does not constitute a concession that Meitzner et al teaches Applicants' step (a). Therefore, regardless of what relevance Meitzner et al might have to their claimed process, Applicants submit that their specification should not be relied upon as teaching that Meitzner et al suggests a connection between their step (a) and other steps of their invention.

Furthermore, regardless of what Applicants' specification discloses about their step (a), none of the patents identified at page 2 discloses the entirety of Applicants' process. Compare U.S. Patent 4,444,961 at column 14, line 44, through column 15, line 23 (haloalkylation followed by amination); U.S. Patent 4,427,794, a counterpart of EP 46,535, at column 10, lines 60-68 (general reference to an encyclopedia); U.S. Patent 4,419,245 at column 6, lines 29-31 (chloromethylation followed by amination or quaternization); and U.S. Patent 5,231,115, a counterpart of WO 93/12167, at column 9 (haloalkylation followed by amination).

Meitzner et al adds little about the general features of Applicants' step (a) that Applicants have not already described in their specification and teaches nothing of any particular relevance about step (d).

With respect to step (a), Meitzner et al discloses the preparation of polymers by suspension polymerization of monoethylenically unsaturated monomers and polyvinylidene monomers but only in the presence of "polymer precipitants." E.g., column 2, lines 57-68. Such polymer precipitants, which are described as being solvents for the monomer precursors but not for the copolymer products, are "strongly repelled by the copolymer mass and [are] actually squeezed out by the copolymer phase leaving a series of microscopic channels" (see column 5, lines 2-5), thereby making the copolymer products porous (e.g., column 5, lines 40-59). That is, Meitzner et al requires the use of porogens and thus does not disclose the more general situation in which porogens can be absent. Consequently, any teachings of Meitzner et al would have relevance - if any relevance can be found at all - only for embodiments of Applicants' invention in which the optional porogen component is present in step (a). However, even if Meitzner et al is applied more broadly to their claims, Applicants submit that nothing in Meitzner et al and the other cited references would suggest their claimed process as a whole, including the use of step (a) as a starting point and proceeding through steps (b), (c), and (d).

It is well established that for an applicant's invention to be obvious in view of a combination of references, something in the art taken as a whole, other than the applicant's disclosure, must provide a reason for selecting the procedure used by the applicant. See *In re Dow Chemical*, 837 F.2d 469, 5 U.S.P.Q.2d 1529, 1532 Mo-5663

(Fed. Cir. 1988); *Interconnect Planning Corporation v. Feil*, 774 F.2d 1132, 1143, 227 U.S.P.Q. 543, 551 (Fed. Cir. 1985). "Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure." *In re Dow Chemical*, 5 U.S.P.Q.2d at 1531 (emphasis added). "The mere fact that the prior art could be . . . modified would not have made the modification obvious unless the prior art suggested the desirability of the modification." *In re Gordon*, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984). It is well established that "identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention." See *In re Kotzab*, 55 U.S.P.Q.2d 1313, 1316-1317 (Fed. Cir. 2000) (emphasis added). Failure to follow these precepts risks "fall[ing] victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher." See *In re Kotzab*, 55 U.S.P.Q.2d at page 1316. Here, Applicants submit that even if their claimed process is "a compilation of generally known steps" as asserted in the Office Action at page 5, the Office Action has not explained how the cited patents would have suggested to those skilled in the art would why they should combine these "generally known steps" to arrive at the process claimed by Applicants. Even if the general method used in step (a) is known, this does not mean that one skilled in the art would have been motivated to use this particular method as a starting point to be followed by the specific additional processes of steps (b), (c), and (d).

The Office Action relies upon Klipper et al as teaching Applicants' steps (b) and (c). Applicants respectfully submit that Klipper et al does not provide the requisite motivation to lead those skilled in the art to their process as a whole. Klipper et al discloses a process for preparing anion exchangers based on crosslinked, water-insoluble organic polymers containing aromatic nuclei by (1) reacting phthalimide with aqueous formaldehyde at pH 5 to 6 (maintained using sodium hydroxide) to obtain N-hydroxymethylphthalimide, which can optionally be converted to the corresponding bis(phthalimidomethyl) ether or an ester, (2) using the product of step (1) to amidomethylate the organic polymer in the presence of Friedel-Crafts catalysts and swelling agents, and (3) saponifying the resultant amidomethylated polymer to form the corresponding aminomethylated polymer. E.g., Mo-5663

column 2, lines 6-26. Klipper et al teaches that the starting polymers are preferably mixed polymers of vinyl aromatic compounds having gel-like or macroporous structures (e.g., column 4, lines 17-62) but does not disclose monodisperse polymers or their use for the preparation of monodisperse aminomethylated polymer products, a critical feature of Applicants' process. Klipper et al also does not disclose alkylation of aminomethylated polymers. In view of the absence of any mention of monodisperse polymer beads or of alkylation of the aminomethylated polymers that are disclosed, Applicants submit that Klipper et al would not lead those skilled in the art to their process as a whole.

The Office Action relies upon Corte et al '866, as well as Meitzner et al, as teaching Applicants' step (d). Applicants respectfully submit that neither reference provides the requisite motivation to lead those skilled in the art to their claimed process as a whole.

First, Meitzner et al teaches nothing relevant about Applicants' step (d). Contrary to what is stated at page 5 of the Office Action, Meitzner et al does not disclose alkylation of aminomethyl groups attached to aromatic rings (as described in Applicants' specification at page 10, lines 15-17). Meitzner et al discloses three processes for making amino compounds. In **one** such process, aromatic rings are chloromethylated and the resultant chloromethyl-substituted polymers are aminated to form aminomethylated polymers. See column 11, lines 59-61 (and continuing through column 12, line 16). In a **second** process, an aromatic polymer is nitrated and the resultant nitro-substituted is reduced to the corresponding amine (in which the amino group is attached directly to the aromatic ring). See column 12, lines 17-25. The second process does not mention alkylation of the resultant aromatic amine. In a **third** process, a polymer includes carboxyl-containing main-chain acrylate units that react with diamines to form side-chain aminoalkyl amides. E.g., column 12, lines 26 et seq. Although the amino groups introduced by the third process can be alkylated (e.g., column 12, lines 66-68), the alkylation does not produce aminomethyl groups attached to aromatic rings. Consequently, it is readily apparent that Meitzner et al does not disclose or suggest step (d) of Applicants' claimed process.

Second, Corte et al '866 discloses a method for aminoalkylating aromatic polymers by reaction with chloromethyl phthalimide in the presence of Friedel-Crafts catalysts followed by saponification and optional alkylation of the amino groups. E.g., column 2, line 50, through column 3. Corte et al '866 does not disclose the use of monodisperse polymers or the preparation of monodisperse aminomethylated polymer products, a critical feature of Applicants' invention. In view of the absence of any mention of monodisperse polymer beads and of the different method used to form the initial amidomethylated polymers, Applicants submit that Corte et al '866 would not lead those skilled in the art to their process as a whole.

Even if the cited references are viewed as individually disclosing bits and pieces of Applicants' process, these references do not provide sufficient motivation to combine the various steps into the unified overall process to obtain monodisperse anion exchangers as claimed by Applicants.

Applicants therefore respectfully submit that their claims are not rendered obvious by the combination of Meitzner et al, Klipper et al, and Corte et al '866.

In view of the preceding amendments and remarks, allowance of the claims is respectfully requested.

Respectfully submitted,

By Richard E.L. Henderson  
Richard E.L. Henderson  
Attorney for Applicants  
Reg. No. 31,619

Bayer Corporation  
100 Bayer Road  
Pittsburgh, Pennsylvania 15205-9741  
(412) 777-8341  
FACSIMILE PHONE NUMBER:  
(412) 777-8363

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## ANNOTATED VERSION OF AMENDMENTS

### IN THE CLAIMS:

Claims 19-24 have been canceled.

Claims 1 and 14 have been amended as follows:

1. (amended) A process for preparing monodisperse anion exchangers comprising
- (a) reacting monomer droplets made from at least one monovinylaromatic compound and at least one polyvinylaromatic compound to give a monodisperse, crosslinked bead polymer,
  - (b) amidomethylating the monodisperse, crosslinked bead polymer from step (a) with [a] phthalimide [~~derivative~~] or methylphthalimide,
  - (c) converting the amidomethylated bead polymer from step (b) to an aminomethylated bead polymer, and
  - (d) alkylating the aminomethylated bead polymer from step (c).
14. (amended) A process according to Claim 13 wherein the phthalimido ether is prepared from phthalimide or [~~from a derivative thereof~~] methylphthalimide and formalin.

### IN THE ABSTRACT:

The Abstract has been amended as follows:

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[~~Mo5663~~]

LeA 33,915

## PROCESS FOR PREPARING MONODISPERSE ANION EXCHANGERS

### ABSTRACT OF THE DISCLOSURE

The present invention relates to a process for preparing novel, monodisperse anion exchangers [~~and to their use~~] by

- (a) reacting monomer droplets made from monovinylaromatic compounds and polyvinylaromatic compounds, and optional porogens and/or initiators,

- (b) amidomethylating the resultant monodisperse, crosslinked bead polymers with phthalimide derivatives.
- (c) converting the amidomethylated bead polymers to aminomethylated bead polymers, and
- (d) alkylating the aminomethylated bead polymers.--